

Emergency Operations Plan 2020 for the Kansas HAB Response Program

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Bill Blair, KDHE program coordinator, consults

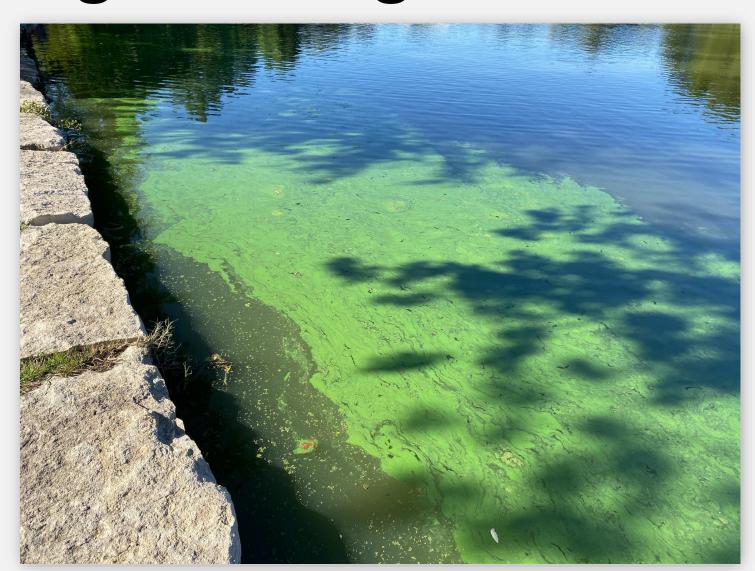
Weekly reports included jar tests, site photos,

and map sketches. Photos: Zach Kesler

with a lake manager. Photo: Thad Powell.



Big Challenges



An unwelcome bloom on Rose's Pond (Johnson Co.); photo by Jeff Carlson.

Summer 2020 presented steep challenges for KDHE's Harmful Algal Bloom Response Program.

Worker health and safety were paramount. Building occupancy restrictions shifted many staff to telework, while travel and fieldwork were curtailed for all but the most critical efforts. And some personnel from Division of Environment were recruited to help support the Division of Public Health in their COVID-19 pandemic response.

Meanwhile, outdoor recreation became increasingly important to the public as a safe, heathy option. Kansas state parks remained open, and lake managers reported unprecedented traffic – likely including many new visitors, unfamiliar with HABs.

As a result, the mission to protect public health took on complex dimensions in 2020. Strong partnerships, clear communication, and some luck, along with the support of a great IT department, provided the foundation for a robust and flexible Emergency Operations Plan.

Clear Priorities



Public Water Supplies

Kansas has over 70 Public Water Systems (PWS) that draw from reservoirs and rivers. A few monitor cyanotoxins independently, and about half of the rest participate in voluntary routine testing through KDHE. When PWS lakes bloom, they are our highest priority – especially if no routine toxin monitoring is yet in place.

Strong Partnerships

Kansas public lakes are managed by a variety of municipal, county, state, and federal agencies. KDHE's Emergency Operations Plan was successful only because of them. Our primary partners are Kansas Department of Wildlife, Parks, and Tourism (KDWPT) and US Army Corps of Engineers. These two agencies, along with many others, stepped up in 2020 to help protect public health.

In addition, the K-State University Veterinary Diagnostic Lab, EPA Region 7 Laboratories, and USGS Kansas Water Science Center all offered assistance with sampling and toxin testing, should the need arise.





Lake mangers from KDWPT, USACE, and many other public agencies provided high quality weekly reports.

Public Outreach

Early in the year, KDHE provided lake managers with HAB Awareness and Pet Safety flyers to post at all water bodies. KDHE and KDWPT communications offices coordinated efforts throughout the season with news releases and educational posts on social media.



Practical Resource Management

Ad hoc:

Complaints received & validated

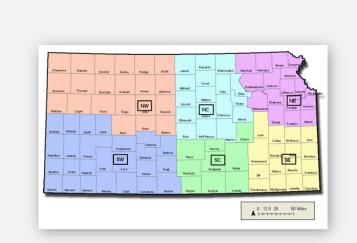
Cell counts and toxin analyses

Thursday:

Advisories issued / lifted

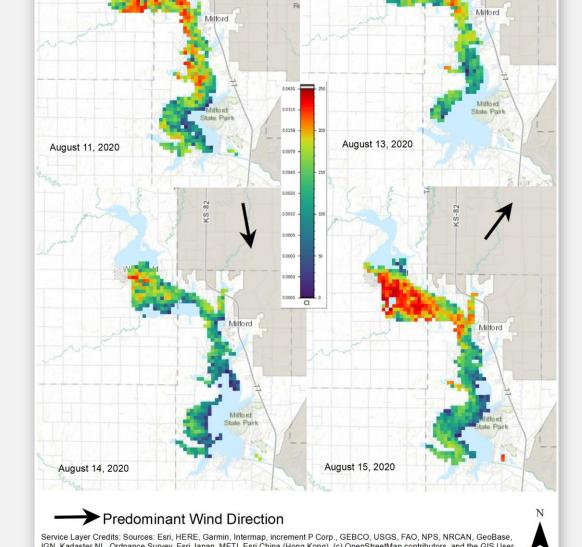
Advisory lakes resampled at 7 to 28 day intervals

District field staff remained engaged but were deployed only in a few defined instances: to protect public water supplies, investigate health complaints or extreme blooms, or visit a lake with no manager on site. Special pre-holiday toxin surveys were also done just before Independence Day and Labor Day.





Teleworking taxonomists were only called in rarely – to identify potentially problematic taxa or run stopgap screenings, not for time consuming routine cell counts. (Photo: Thad Powell)



At over 27 mi², Milford Reservoir is the largest lake in the state, and it has a history of persistent and intense HABs. In 2020, at least some portion of Milford was on HAB advisory for 16 of the 31 weeks of the recreation season. About 35 Kansas lakes are reliably visible from space, including seven that bloomed in 2020.

Eye in the Sky

The Cyanobacteria Assessment Network (CyAN), a shared initiative of USEPA, NOAA, USGS, and NASA, provides satellite imagery of cyanobacteria blooms in U.S. freshwater lakes. Through modeling algorithms, raw satellite images from Sentinel 3-OLCI are converted into an index that represents cyanobacterial cell concentrations at 300 x 300 m pixel resolution. Interpretations are considered robust in lakes with a minimum array of 3 x 3 pixels. Kansas has about 35 of these, though many smaller water bodies are "visible" to some extent.

Although Kansas has a complaint-based HAB program, we used daily and weekly CyAN imagery in 2020 to detect blooms in early stages, inform lake managers, and monitor change and dissipation. During each weekly stakeholder conference call, KDHE provided a list of lakes with estimated cell count index. This was used as "heads up" for potential blooms and as supporting evidence for lake manager reports. In some cases, a bloom developing in open water is not immediately obvious from shoreline observations, so satellite data provides a means of early

The daily imagery, when interpreted in the context of weather data, was also helpful in tracking the location of a bloom. And when a Public Water Supply lake was threatened or a health complaint required investigation. the imagery also helped field staff focus their efforts – especially on waterbodies with extensive surface area or convoluted shorelines.

A New Routine Built on Clear Communication

Normal Operations **Emergency Operations**

Ad hoc: **Complaints received & validated**

> Monday: **KDHE** queries Lake Managers

Tuesday-Wednesday: Lake Managers send structured reports, including site photos and jar tests from fixed access points

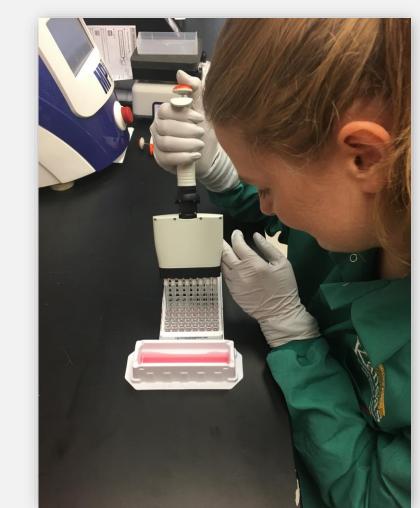
> Thursday: Advisories issued / lifted

Managers of Advisory lakes send weekly updates

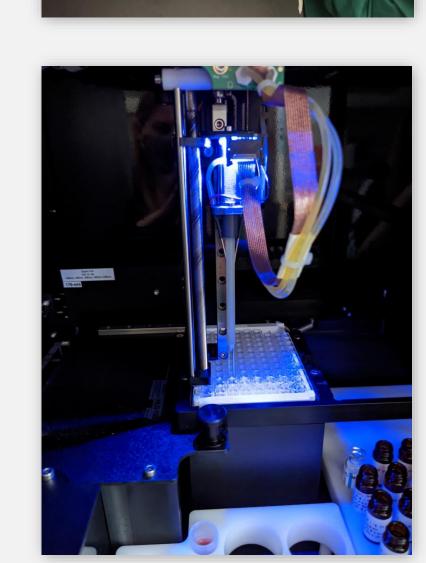
A Timely Investment Pays Off

In Emergency Operations mode, the Kansas HAB Response Program issued advisories based primarily on visual evidence, rather than cell counts or toxin levels. However, the capacity to survey for cyanotoxins remained critically important. In 2020, the Response Program benefited from increased analysis capacity that had been developed to support Public Water Systems.

Manual analysis (top) was replaced by automated analysis (bottom) in 2020. Photos: Meredith Heath









Samples for cyanotoxin testing. Photo: Thad Powell.

provides routine cyanotoxin analysis for the all Public Water Systems (PWS) enrolled in KDHE's voluntary monitoring program. The lab also performs emergency testing for any PWS that requests testing due to unexpected HABs near their intakes.

KHEL measures Microcystins/Nodularins using indirect competitive enzyme-linked immunosorbent assay (ELISA) and can also test for Cylindrospermopsin Anatoxin-a, and Saxitoxin using direct ELISA. ELISA can be labor intensive, and sampling must be well coordinated to ensure timely results. Received samples are first subjected to three freeze-thaw cycles to break cell walls and release toxins; only then is the sample ready for analysis.

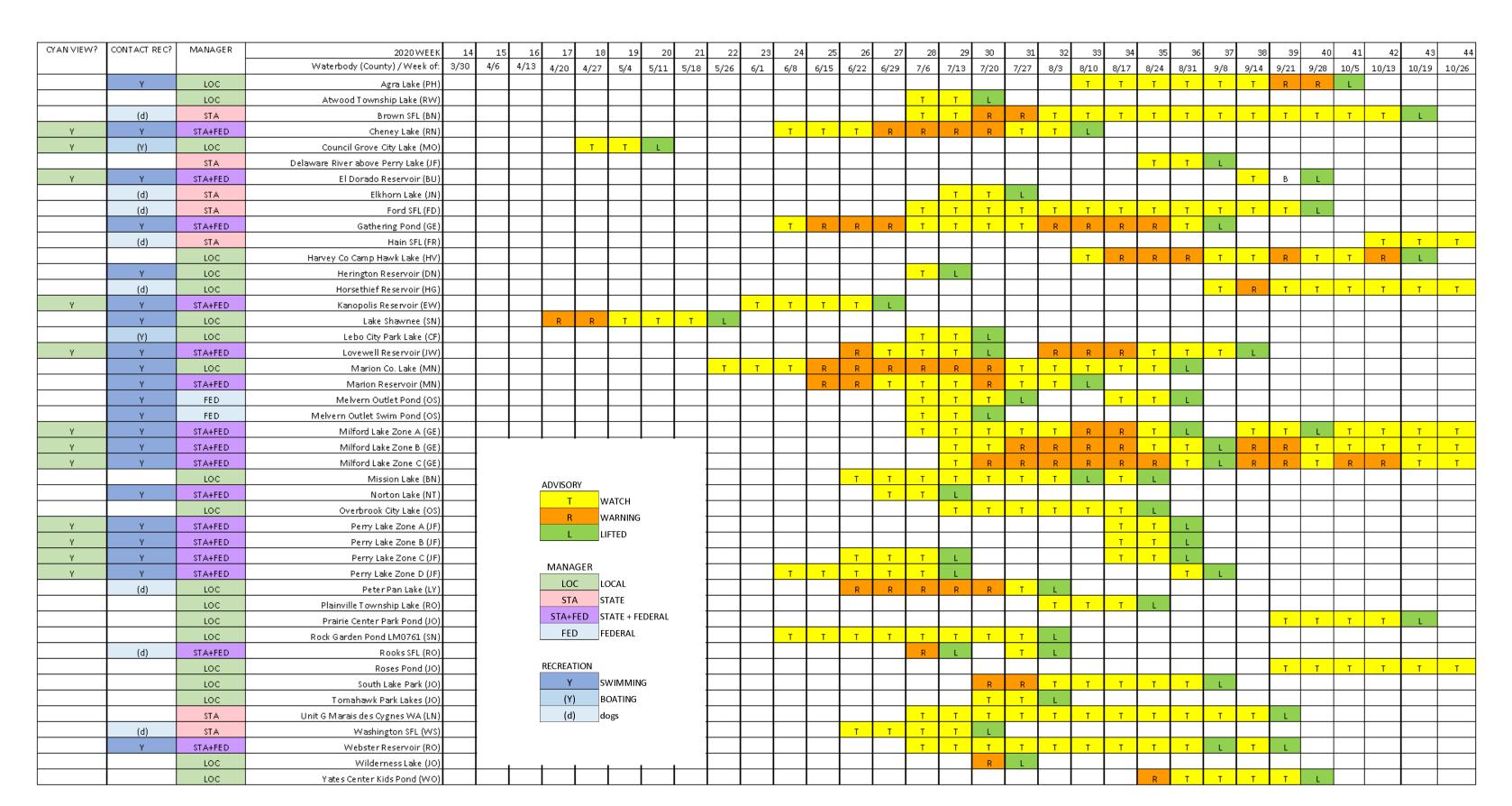
When KHEL began analyzing cyanotoxins in 2018, all assays were performed manually. Within a year, the number of weekly voluntary routine raw water samples more than tripled. Moreover, under standard monitoring guidelines, a single microcystin detection over 0.3 ug/L in raw water triggers a sixfold increase number of samples from that facility.

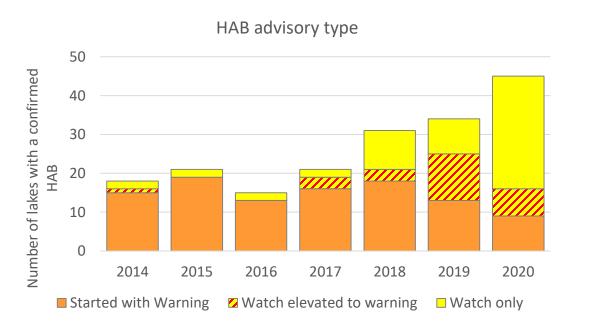
In response to increased demand, early in 2020, KHEL acquired a CAAS CUBE analyzer (Eurofins Scientific) to automate ELISA testing. This increased throughput from ten to thirty-three samples per four-hour run, while allowing lab staff to multitask for efficiency.

This investment, which was made to serve the PWS program, provided a serendipitous benefit to the HAB Response Program. With increased capacity, KHEL was able to test ambient water samples to support risk assessment for severe blooms, health investigations, and mitigation projects.

KHEL's well established shipping, receiving, and tracking infrastructure also ensured that District field staff had the supplies they needed to work safely. Because of this, the HAB Response Program was able to perform two complete toxin surveys of all Advisory lakes – one prior to Independence Day and one prior to Labor Dav.

2020 HAB Advisory Summary

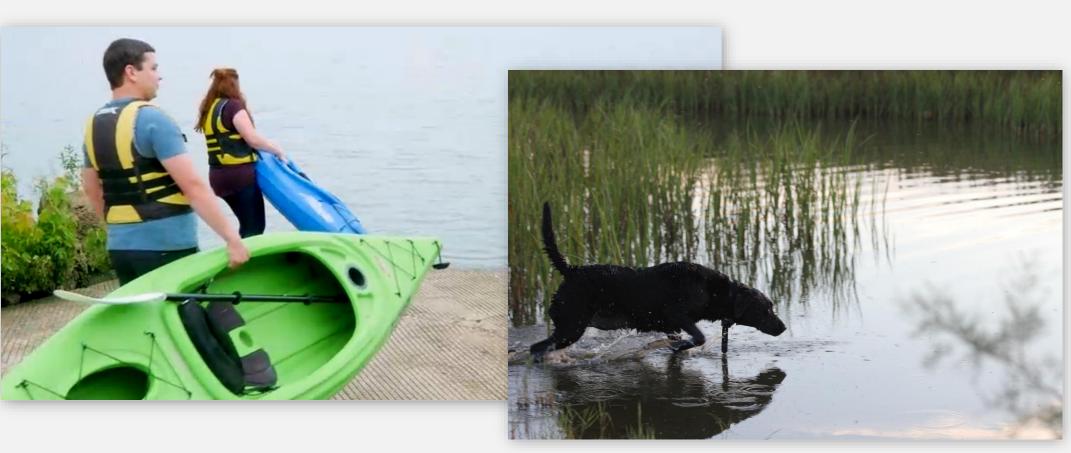




Conclusions

Compared to prior years, Kansas issued more Watches and slightly fewer Warnings in 2020. However, the trajectories of individual advisories were similar to those seen in the past. With the help of many partners, KDHE was able to adapt to unprecedented challenges to provide reliable HAB Response and outreach. In addition, the partnerships established with lake managers in 2020 will likely serve the public for many years to come.

Protecting Public Health and Responding to Health Incidents



Public lakes with human contact recreation and domestic animal exposure receive special attention from the HAB Response Program. In addition, the KDHE Division of Public Health receives direct reports of HABrelated human and animal health incidents. Providing environmental samples to support their investigations is a high priority.

Water dog photo courtesy of KDWPT